AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/9007		
Aircraft Registration	**ZS-LHG**	**Date of Accident**	2 February 2012		**Time of Accident**	0730Z	
Type of Aircraft	Piper PA-20 (Aeroplane)		**Type of Operation**		Private Flight		
Pilot-in-command Licence Type	Commercial Pilot		**Age**	24	**Licence Valid**	Yes	
Pilot-in-command Flying Experience	Total Flying Hours		293,2		Hours on Type	6.3	
Last point of departure	Angels' Way aerodrome, (KwaZulu-Natal province)						
Next point of intended landing	Angels' Way aerodrome, (KwaZulu-Natal province)						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
Angels' Way aerodrome near Eston (geographical co-ordinates: South 29°51'32.83" East 030°31'05.19")							
Meteorological Information	Surface wind; 045°/4-5kt; Temperature: 23°C; Visi bility: +10 km						
Number of people on board	2 + 0	**No. of people injured**	2	**No. of people killed**	0		

Synopsis

The pilot flying (PF) was conducting his first flight on a Piper PA-20 after completing his conversion on the type 57 days previously. He was accompanied by a pilot rated on the type, as it was recommended that he should fly 10 hours as pilot-in-command under supervision (PICUS) following his conversion.

The pilot took off from runway 04 at Angels' Way aerodrome, flew one circuit and landed on runway 22. He then backtracked to the threshold of runway 04 and proceeded with his second takeoff. Approximately 200 m beyond the threshold, he lost directional control and the aircraft veered to the right. Before the pilot-not-flying (PNF) could intervene, the aeroplane left the runway surface and rolled downhill through a grassy area for 112 m before striking a heap of building rubble concealed in the vegetation. The aircraft nosed over, coming to rest upside down in a ditch. The PF, who remained conscious after the impact, managed to unclip his safety harness. He then freed the PNF, who was unconscious, and pulled him from the wreckage, which had caught alight near the auxiliary fuel tank. The farm manager arrived in his private vehicle on the scene and took both occupants to hospital in Pietermaritzburg. The aircraft was consumed by the post-impact fire.

Probable Cause

Loss of directional control during the takeoff roll.

Contributory factor: PF's lack of experience on tailwheel aircraft.

IARC Date		Release Date	

AIRCRAFT ACCIDENT REPORT

Name of Owner	**:** Angel's Way Trust
Name of Operator	**:** Private Flight
Manufacturer	**:** Piper Aircraft Corporation
Model	**:** PA-20
Nationality	**:** South African
Registration Marks	**:** ZS-LHG
Place	**:** Angel's Way aerodrome near Eston
Date	**:** 2 February 2012
Time	**:** 0730Z

All times given in this report are Co-ordinated Universal Time (UTC) and are denoted by (Z). South African Standard Time is UTC plus two hours.

Purpose of the Investigation

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (1997,) this report was compiled in the interests of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and ***not to establish legal liability.***

Disclaimer

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1. FACTUAL INFORMATION

1.1 History of flight

1.1.1 The pilot-in-command was the pilot flying (PF) when the accident occurred. This was his first flight on a Piper PA-20 after completing his conversion on the aircraft type 57 days previously. He was accompanied by a pilot with far more experience than himself on the type, as it was recommended that he should fly 10 hours as pilot-in-command under supervision (PICUS) following his conversion.

1.1.2 After conducting a detailed pre-flight inspection, the pilot took off from runway 04 at Angels' Way aerodrome, flew one circuit and landed on runway 22. Runway 04 has a substantial downward slope and the recommended practice at the aerodrome is to take off from runway 04 and land on runway 22 the upward slope. The prevailing

wind was reported to be from the north-east at about 5 kt. After landing, the PF taxied back to the threshold of runway 04 for his second takeoff. He completed his pre-takeoff checks and opened the throttle. At approximately 70 mph indicated airspeed, he lost directional control and, before the pilot-not-flying (PNF) could intervene, the aircraft veered to the right off the runway surface, rolled down the grassy verge for 112 m and collided with a heap of building rubble concealed in the vegetation. The aircraft nosed over, coming to rest upside down in a ditch.

1.1.3 The PF remained conscious throughout the impact sequence. He released his safety harness, than freed the pilot-not-flying (PNF), who was unconscious, and pulled him through the left aft door, which was open. A fire had erupted near the auxiliary fuel tank in the rear of the fuselage and the tank exploded when the pilots were about 10 m away. The wreckage was consumed by fire.

1.1.4 People from the farm arrived on the scene within minutes and assisted the pilots. They were followed by the manager of the farm, who took the pilots to hospital in Pietermaritzburg in his own vehicle. Both pilots suffered from facial lacerations, which required stitches. The PNF underwent surgery to his face later the same evening. He also had a fractured finger on his right hand and a compressed vertebra.

1.1.5 Upon arrival at the accident scene later on the same day, the investigator-in-charge (IIC) noted that the prevailing wind was from the east at 10 to 15 kt. According to available information, the wind stayed much the same during the course of the day. The aircraft had ample fuel on board, with the last refuelling (97,5 ℓ of avgas) having taken place on 22 January 2012 at Pietermaritzburg aerodrome.

1.1.6 The accident occurred during daylight at the co-ordinates South 29° 51’32.83” East 030° 31’05.19” and at an elevation of 2 476 ft abov e mean sea level (AMSL).

1.2 Injuries to persons

Injuries	Pilot	Crew	Pass	Other
Fatal	-	-	-	-
Serious	1	-	-	-
Minor	1	-	-	-
None	-	-	-	-

1.3 Damage to aircraft

1.3.1 The aircraft was destroyed by the post-impact fire. All that remained were the spinner, propeller and tail wheel.

Figure 1: The burnt-out wreckage.

1.4 Other damage

1.4.1 Apart from a minor veld fire, there was no other damage.

1.5 Personnel information

1.5.1 Pilot-in-command (PIC)

Nationality	South African	Gender	Male	Age	24
Licence number	0272202508	Licence type	Commercial Pilot		
Licence valid	Yes	Type endorsed	Yes		
Ratings	None				
Medical expiry date	31 May 2012				
Restrictions	None				
Previous accidents	None				

Flying experience

Total hours	293,2
Total past 90 days	39,1
Total on type past 90 days	6,3
Total on type	6,3

The pilot flew a total of 6,2 hours dual on the Piper PA-20 as part of his conversion training, completing the conversion on 7 December 2011. However, the flight instructor entered a note on the pilot's CA 61-13.7 familiarisation training form recommending him to fly 10 hours PICUS (pilot-in-command under supervision) after completing the conversion at the aerodrome, in this case Angles' Way, from which he was going to operate. It should be noted that the CAA endorsed the type rating on the pilot's licence following the submission of form CA 61-13.7 with the 10-hour PICUS as a recommendations.

The accident flight took place 57 days later, and was the pilot's first flight on a Piper PA-20 after completion of the conversion. The pilot who accompanied him was appropriately rated on the type and was highly experienced on tailwheel-type aircraft.

1.5.2 Pilot-not-flying (PNF)

Nationality	South African	Gender	Male	Age	48
Licence number	0270260318	Licence Type	Private Pilot		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Night Rating; Test Pilot Rating Class 2				
Medical expiry date	30 April 2012				
Restrictions	Corrective lenses				
Previous accidents	None				

Flying experience

Total Hours	2 750,0
Total past 90 days	60,0
Total on type past 90 days	11,0
Total on Type	125,0

1.6 Aircraft information

Airframe

Type	Piper PA-20	
Serial number	20-354	
Manufacturer	Piper Aircraft Corporation	
Year of manufacture	1949	
Total airframe hours (at time of accident)	3 575,0	
Last MPI (hours & date)	3 519,9	4 July 2011
Hours since last MPI	55,1	
C of A (issue date)	19 June 2002	
C of A (expiry date)	18 June 2012	
C of R (issue date) (present owner)	2 March 2010	
Operating categories	Standard Part 135	

Engine

Type	Lycoming O-320-E2A
Serial number	L-22516-27A
Hours since new	3 575,0
Hours since overhaul	839,4

Propeller

Type	Sensenich M76DM6-0-61
Serial number	A54333
Hours since new	840,5
Hours since overhaul	308,5

1.7 Meteorological information

1.7.1 The aviation routine weather report (METAR) for Pietermaritzburg aerodrome (FAPM) on 2 February 2012 at 0730Z provided the following data:

Wind direction	090°	Wind speed	5 kt	Visibility	+ 10 km
Temperature	23℃	Cloud cover	Nil	Cloud base	Nil
Dew point	Unknown				

1.7.2 Weather information obtained from the pilot's questionnaire:

Wind direction	045°	Wind speed	4 kt	Visibility	+ 10 km
Temperature	23℃	Cloud cover	4/8	Cloud base	5 000 ft
Dew point	Unknown				

1.7.3 Figure 2 below was taken by the IIC shortly after his arrival at the aerodrome. The view is from runway 04 facing the direction of takeoff, i.e., towards the threshold of runway 22. The windsock is visible on the right, indicating a crosswind.

Figure 2: View from runway 04 with the windsock visible on the right.

1.8 Aids to navigation

1.8.1 The aircraft was equipped with standard navigational equipment, which was serviceable at the time of the accident.

1.9 Communications

1.9.1 The flight was conducted outside controlled airspace below the terminal control area (TMA). All transmissions were broadcast on the VHF frequency

124.20 MHz, the designated frequency in the aerodrome area. Both pilots indicated afterwards that the communication equipment had been serviceable during the flight.

1.10 Aerodrome information

Aerodrome location	Angel's Way aerodrome	
Aerodrome co-ordinates	S29°51'42.64" E030°30'58.4 5"	
Aerodrome elevation	2 559 ft at threshold of runway 04	
Runway designations	04/22	
Runway dimensions	880 m x 8 m	
Runway used	04	
Runway surface	Asphalt	
Approach facilities	None	
Aerodrome status	Unlicensed	

The aerodrome is constructed on sloping terrain. The runway slopes downwards from both thresholds at approximately 5°, as can be seen in Figure 4.

Figure 3: The aerodrome with the runway visible on the far side of the hangars.

Figure 4: The runway seen from the threshold of runway 04.

1.11 Flight recorders

1.11.1 The aircraft was not equipped with a flight data recorder or cockpit voice recorder. Neither was required by regulation to be fitted to this type of aircraft.

1.12 Wreckage and impact information

1.12.1 The aircraft veered off the right of runway 04 approximately 250 m from the threshold. The print from the left main tyre can be clearly seen on the surface (see Figure 5). The aeroplane then rolled downhill through a grassy area for 112 m before striking a heap of building rubble hidden in the vegetation. It nosed over on impact, coming to rest inverted in a ditch. A fire erupted near the auxiliary fuel tank and destroyed the aircraft.

Figure 5. The left main tyre print on the runway surface.

1.13 Medical and pathological information

1.13.1 Not applicable.

1.14 Fire

1.14.1 The wreckage was destroyed by a post-impact fire that began near the auxiliary fuel tank. This tank exploded when he and the PNF were five to ten metres away, and the fire spread quickly, fed by fuel leaking from the ruptured wing tanks. The fabric covering the airframe was consumed very rapidly.

1.14.2 A small area of vegetation was set alight by fuel from the ruptured tanks.

1.15 Survival aspects

1.15.1 The PF remained conscious during the impact sequence. After the aircraft came to rest upside down, he released his safety harness and realised that the PNF was unconscious. He unclipped the PNF's harness and pulled him out of the wreckage

through the left aft door. While doing this, he was aware that a fire had erupted near the auxiliary fuel tank. As the PF carried the PNF away from the wreckage, the tank exploded. Minutes later, people from the farm were on hand to assist them.

1.15.2 Both occupants suffered facial lacerations and were bleeding profusely. The manager of the farm took them to a private hospital in Pietermaritzburg in his vehicle. The PF had lacerations to his lower chin, which required stitches, and was discharged later that same day. The PNF underwent surgery to his mouth and face, he also fractured a finger on his right hand and had a compressed vertebra (L2) in his lower back.

1.16 Tests and research

1.16.1 None considered necessary.

1.17 Organisational and management information

1.17.1 This was a private flight operated from a private aerodrome.

1.17.2 The aircraft maintenance organisation (AMO) that carried out the last maintenance periodic inspection (MPI) prior to the accident flight had been in possession of a valid AMO approval certificate.

1.18 Additional information

1.18.1 Transition to tailwheel aircraft

In Annexure A, attached to this report, information is provided on both a normal and crosswind takeoff in a tailwheel aircraft.

1.19 Useful or effective investigation techniques

1.19.1 None.

2. ANALYSIS

2.1 Pilots

The PF was in possession of a valid commercial pilot's licence. He successfully completed his conversion on the Piper PA-20 on 7 December 2011, during which he flew 6,2 hours on type. The flight instructor who endorsed the conversion indicated on the applicable CAA form (CA 61-31.7), that the pilot was required to fly a further 10 hours PICUS on type. The PF complied with this requirement on the accident flight by having a second pilot with him who was appropriately rated on type and experienced on tailwheel aircraft.

The flight on 2 February 2012 was, however, the PF's first flight on a Piper PA-20 after he had completed his conversion 57 days previously. During an interview with the pilot, he indicated that he found the takeoff and landing techniques between a tailwheel aircraft and one with a tricycle gear very different. A tailwheel aircraft requires considerably more rudder pedal input to ensure directional stability, especially when the tail lifts from the runway surface, and he had to concentrate on getting this correct. Another fundamental difference is that a tailwheel aircraft requires a gradual advance of the throttle as the aircraft accelerates along the runway during the takeoff roll because power cannot be applied against the brakes as with a tricycle gear aircraft. In short, when flying a tailwheel aircraft, a pilot has to concentrate hard to ensure that directional stability is not compromised.

The possibility does exist that the aircraft might have encountered a gust of wind from the right during the takeoff roll, and that this caught the PF off guard and induced a yaw to the right. With the aircraft travelling at a substantial speed at this stage and having already reached the critical phase of the takeoff roll, the PF was unable to correct the yaw in time. The PNF confirmed this, stating that the yaw occurred so quickly he was unable to intervene before the aircraft left the runway surface. Once the aeroplane was on the grassy slope, the brakes appeared to be largely ineffective and the aeroplane rolled rapidly downhill, finally colliding with a heap of building rubble. This caused it to nose over and a subsequent post-impact fire erupted, destroying the aircraft.

2.2 Aircraft

The aircraft was properly maintained and in possession of a valid certificate of

airworthiness at the time of the flight. Neither crew member reported any malfunction with the aircraft that could have contributed to, or caused, the accident.

2.3 Flight

There was nothing extraordinary about the flight. The takeoff was normal and the PF was familiar with the substantial downhill slope and narrowness of the runway. The PF's first takeoff and circuit were uneventful. During the second attempted takeoff, the PF lost directional control and veered off the runway.

2.4 Environment

According to both crew members, it was slightly overcast, with the prevailing wind from the north-east at 4-5 kt. According to the aviation routine weather report (METAR) for FAPM (26 km NW of Angel's Way) at approximately the same time as the accident, the wind was from the east (090°) at 5 kt, and visibility was good.

3. CONCLUSION

3.1 Findings

3.1.1 The PF was in possession of a valid commercial pilot's licence and had the aircraft type endorsed in his logbook.

3.1.2 The PF was in possession of a valid aviation medical certificate issued by a SACAA-approved medical examiner.

3.1.3 The PF conducted the flight under the supervision of another pilot appropriately rated on type as stated on his type conversion form, which required him to fly ten hours PICUS (pilot-in-command under supervision).

3.1.4 This was the pilot-in-command's first flight on a Piper PA-20 since completing his conversion on the type on 7 December 2011.

3.1.5 The PNF was the holder of a valid private pilot's licence and had the aircraft type endorsed in his logbook. According to his pilot's logbook, he had 125 flying hours on the type.

3.1.6 Both pilots were admitted to hospital after the accident. The PNF underwent surgery and the PF sustained lacerations to his lower chin that required stitches.

3.1.7 A period of 57 days passed between the date the PF completed his conversion on the Piper PA-20 and his first flight on the type thereafter – the accident flight.

3.1.8 The verge on the right of runway 04 consisted of fairly tall grass and sloped downwards at about 5°.

3.1.9 Fine weather conditions were reported, with the prevailing wind being from a northeast to easterly direction at 4-5 kt.

3.2 Probable cause/s

3.2.1 Loss of directional control during the takeoff roll.

3.3 Contributory factors

3.3.1 The PF's lack of experience on tailwheel aircraft.

3.3.2 A slight runway camber to the right.

3.3.3 A possible crosswind from the right (easterly).

3.3.4 A downward sloping verge.

4. SAFETY RECOMMENDATIONS

4.1 It is recommended that the pilot be subjected to additional dual flight training on the Piper PA-20, which special emphasis on crosswind takeoffs and landings. Such training should be conducted under the auspices of a flight instructor rated on the type.

5. APPENDICES

5.1 Annexure A (Transition to Tailwheel Airplanes)

Compiled by:

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J.P. Grobbelaar Date: 12 March 2012

For: Director of Civil Aviation

ANNEXURE A

Source: Airplane Flying Handbook FAA-H-8083-3A, Chapter 13, Tailwheel Airplanes

Normal takeoff roll

After taxiing onto the runway, the airplane should be carefully aligned with the intended takeoff direction, and the tailwheel positioned straight, or centred. In airplanes equipped with a locking device, the tailwheel should be locked in the centred position. After releasing the brakes, the throttle should be smoothly and continuously advanced to takeoff power. As the airplane starts to roll forward, the pilot should slide both feet down on the rudder pedals so that the toes or balls of the feet are on the rudder portions, not on the brake portions.

An abrupt application of power may cause the airplane to yaw sharply to the left because of the torque effects of the engine and propeller. Also, precession will be particularly noticeable during takeoff in a tailwheel-type airplane if the tail is rapidly raised from the three point to the level flight attitude. The abrupt change of attitude tilts the horizontal axis of the propeller, and the resulting precession produces a forward force on the right side (90° ahead in the direction of rotation), yawing th e airplane's nose to the left. The amount of force created by this precession is directly related to the rate the propeller axis is tilted when the tail is raised. With this in mind, the throttle should always be advanced smoothly and continuously to prevent any sudden swerving.

Smooth, gradual advancement of the throttle is very important in tailwheel-type airplanes, since peculiarities in their takeoff characteristics are accentuated in proportion to how rapidly the takeoff power is applied.

As speed is gained, the elevator control will tend to assume a neutral position if the airplane is correctly trimmed. At the same time, directional control should be maintained with smooth, prompt, positive rudder corrections throughout the takeoff roll. The effects of torque and P-factor at the initial speeds tend to pull the nose to the left. The pilot must use what rudder pressure is needed to correct for these effects or for existing wind conditions to keep the nose of the airplane headed straight down the runway. The use of brakes for steering purposes should be avoided, since they will cause slower acceleration of the airplane's speed, lengthen the takeoff distance, and possibly result in severe swerving.

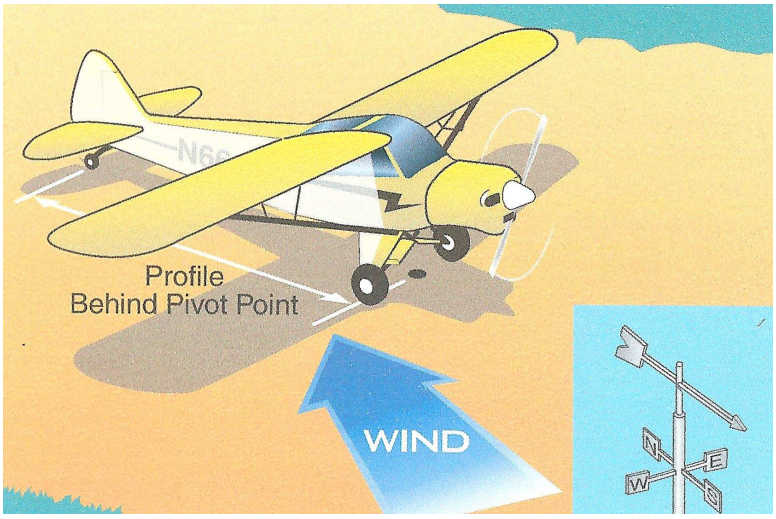
When the elevator trim is set for takeoff, on application of maximum allowable power, the airplane will (when sufficient speed has been attained) normally assume the correct takeoff

pitch attitude on its own – the tail will raise slightly. This attitude can then be maintained by applying slight back-elevator pressure. If the elevator control is pushed forward during the takeoff roll to prematurely raise the tail, its effectiveness will rapidly build up as the speed increases, making it necessary to apply back-elevator pressure to lower the tail to the proper takeoff attitude. This erratic change in attitude will delay the takeoff and lead to directional control problems. Rudder pressure must be used promptly and smoothly to counteract yawing forces so that the airplane continues straight down the runway.

While the speed of the takeoff roll increase, more and more pressure will be felt on the flight controls, particularly the elevators and rudder. Since the tail surfaces receive the full effect of the propeller slipstream, they become effective first. As the speed continues to increase, all of the flight controls will gradually become effective enough to maneuvre the airplane about its three axes. It is at this point, in the taxi to flight transition, that the airplane is being flown more than taxied. As this occurs, progressively smaller rudder deflections are needed to maintain direction.

<u>Crosswind Takeoff</u>

The pilot must be alert for directional control difficulties during the takeoff roll. It is important to establish and maintain the proper amount of crosswind correction prior to lift-off; that is, apply aileron pressure toward the wind to keep the upwind wing from rising and rudder pressure as needed to prevent weathervaning.



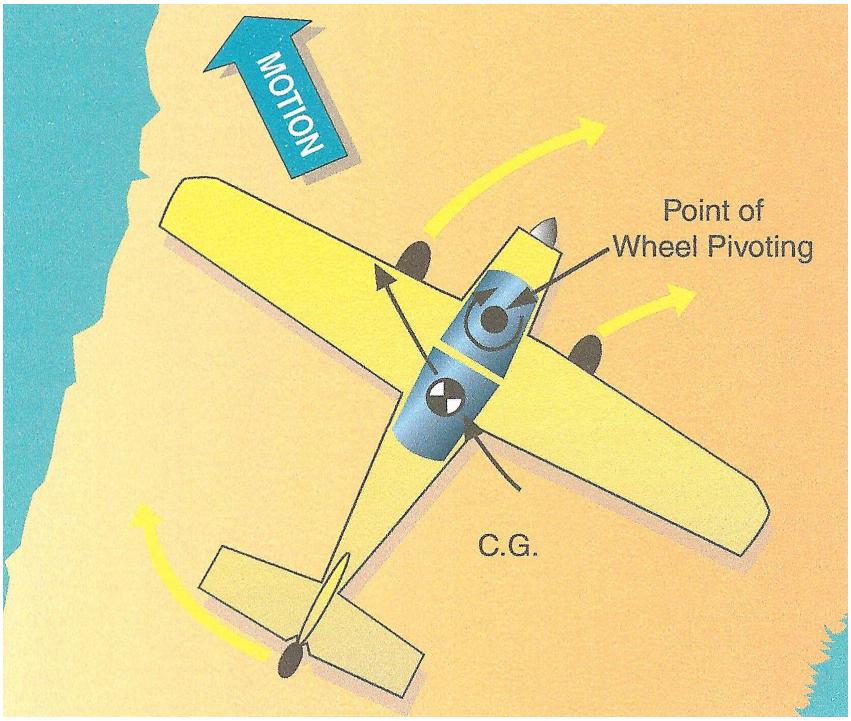
Weathervaning tendency.

As the tailwheel is raised off the runway, the holding of aileron control into the wind may result in the downwind wing rising and the downwind main wheel lifting off the runway first, with the remainder of the takeoff roll being made on one main wheel. This is acceptable and is preferable to side-skipping.

If a significant crosswind exists, the main wheels should be held on the ground slightly longer than in a normal takeoff so that a smooth but definite lift-off can be made. This procedure will allow the airplane to leave the ground under more positive control so that it will definitely remain airborne while the proper amount of drift correction is being established. More importantly, it will avoid imposing excessive side loads on the landing gear and prevent possible damage that would result from the airplane settling back to the runway while drifting.

As both main wheels leave the runway, and ground friction no longer resists drifting, the airplane will be slowly carried sideways with the wind until adequate drift correction is maintained.

The centre of gravity (CG) of the aircraft is located behind the main wheels. Any difference between the direction the airplane is travelling and the direction it is headed will produce a moment about the pivot point of the wheels, and the airplane will tend to swerve. Loss of directional control may lead to an aggravated, uncontrolled, tight turn on the ground, or a ground loop. The combination of inertia acting on the CG and ground friction of the main wheels resisting it during the ground loop may cause the airplane to tip or lean enough for the outside wingtip to contact the ground, and may even impose a sideward force that could collapse the landing gear.



The CG has an effect on directional control.

Pilots should be familiar with the crosswind component of each airplane they fly, and avoid operations in wind conditions that exceed the capability of the airplane, as well as their own limitation.